South Coast Air Quality Management District

Monitoring & Engineering
Source Testing and Engineering

TECHNICAL GUIDANCE DOCUMENT R-002

Rules: 2011-Protocol for Monitoring, Reporting, and Recordkeeping for Oxides of Sulfur (SO_x) Emissions, Appendix A, Chapter 2.
2012-Protocol for Monitoring, Reporting, and Recordkeeping for Oxides of Nitrogen (NO_x) Emissions, Appendix A, Chapter 2.

Date: August 26, 1997

Subject: Quality Assurance Requirements for CEMS Modification

References: 40 CFR Part 60
40 CFR Part 75

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1. Introduction

The monitoring provisions of RECLAIM require facility operators to develop, submit, and adopt a continuous emission monitoring system (CEMS) quality assurance plan (QAP) approved by the AQMD. The QAP must contain quality assurance and quality control (QA/QC) procedures that will be implemented by the facility to ensure that the CEMS generates accurate and precise emissions data on a continuing basis. Quality assurance is accomplished by conducting CEMS related tests on a periodic basis that determine the ability of the CEMS to perform within a known degree of accuracy and precision, and quality control is accomplished through proper operation and maintenance activities. The RECLAIM regulations do not provide specific guidance regarding the requirements of these activities.

The RECLAIM CEMS post-certification subcommittee developed this document to provide guidance to facility permit holders on QAP related issues when CEMS components are replaced and/or modified. Each activity was considered separately and the corresponding assessment demonstration was selected based upon the nature of the subject component; i.e. type, function, relation to overall system function, etc. Basic principles of operation, manufacturers recommendations, and actual instrument and CEMS experience were all considered. These procedures and requirements are based on the fact that maintenance is a necessary element of quality control, that the replacement of parts is an essential aspect of both preventative and corrective maintenance, and that the replacement of different components requires different demonstrations of the adequacy and integrity of the CEMS.

2. Objective

The implementation of the procedures in this document will maintain consistency in emissions data quality and reduce implementation costs. The prevailing technical impact of the adoption of this

proposal will streamline the quality assurance process by introducing clarity and consistency both for the AQMD and the facility permit holders. Also, these QA requirements will result in lower RECLAIM implementation costs for both the AQMD and the facilities because of a reduced need for case-by-case interpretation.

3. Applicability and Procedures

The procedures are presented in the form of a flow chart and two matrices. The types of CEMS component replacements and modifications are divided into two categories: ”like” and “unlike” replacements. Matrix 1 is for “like” replacements and Matrix 2 is for “unlike” replacements. To determine the appropriate matrix for any particular application, please refer to the flow chart that precedes the matrices in this document. If there are any items that are not covered by this document, please contact the CEMS engineer who is handling the application. This document is effective as of July 23, 1997.

APPROVED

attachments:

General Questions

Will the CEMS modification Change:

1) Technology?
2) Equipment Manufacturer or Model?
3) Material or Design?
4) Location of Equipment?

Any general question answered "yes"

All general questions answered "no"

Refer to Matrix 1
Like Replacements

System Specific Questions

Will the CEMS modification affect:

Sample Acquisition and Conditioning

Sample representablity?
Sample composition?
System response time?

Data Acquisition and Handling System

Data quality?
Calculation results?

Flow Monitoring System (fuel or stack)

Sample representablity?
System response time?
Measurement sensitivity?
Measurement precision?
Measurement accuracy?

Analyzers

Measurement selectivity?
Measurement sensitivity?
Measurement precision?
Measurement accuracy?
Measurement response time?
Interference?

no

yes

Refer to Matrix 2
Unlike Replacements

Figure 1

Matrix 1: Like Replacements Only

All Replacements are for like in all aspects; ie OEM, model, temperature settings

RECLAIM CONTINUOUS EMISSION MONITORING SYSTEM
QUALITY ASSESSMENT TESTS FOLLOWING QUALITY CONTROL ACTIVITIES[1]

Quality Assessment ⇒ / Quality Control ⇓	CEMS Calibration[2]	Manual Transmitter Calibration	Linearity Test[3]	Interference[4]	NO_2 Converter Efficiency[5]	Sample System Bias[6]	Analytical RATA[7]	Stack Flow Rate RATA[7]	Response Time
Sample System Components:									
Probe replacement	✔								
Probe filter replacement	✔								
Heated sample line replacement	✔					✔			✔
Condenser replacement	✔					✔			✔
Sample pump repair/replacement	✔								
Sample filter replacement	✔								
Hardware/Software Components:									
CEM controller components replacement	✔								
DAHS hardware replacement [9]									
DAHS software reloading	✔								
Fuel Flow Metering System:									
Primary element replacement [9]									
Transmitter replacement		✔							
In-Stack Flow Monitor									
Sensor Recalibration [9]									
Sensor Replacement [9]									
Probe Replacement [9]									
Transmitter Recalibration		✔							
Transmitter Replacement		✔							
NO_x Analyzer:									
NO_2 Converter replacement	✔				✔				
Photomultiplier tube replacement	✔								
Photomultiplier tube cleaning	✔								
Analyzer replacement	✔		✔	✔	✔		✔		✔
Pre-certified analyzer	✔								
Analyzer vacuum pump repair/replacement	✔								
Analyzer filter replacement	✔								
Ozone generator replacement	✔								
PC Board Replacement	✔								
Thermo-electric temp cont. board	✔								
Optics cleaning/replacement	✔								
Chopper belt/motor replacement	✔								
Capillary replacement	✔								

Matrix 1: Like Replacements Only

All Replacements are for like in all aspects; ie OEM, model, temperature settings

RECLAIM CONTINUOUS EMISSION MONITORING SYSTEM
QUALITY ASSESSMENT TESTS FOLLOWING QUALITY CONTROL ACTIVITIES(1)

Quality Assessment ⇒ / Quality Control ⇓	CEMS Calibration(2)	Manual Transmitter Calibration	Linearity Test(3)	Interference(4)	NO_2 Converter Efficiency(5)	Sample System Bias(6)	Analytical RATA(7)	Stack Flow Rate RATA(7)	Response Time
SO_2 Analyzer									
Analyzer Replacement	✔		✔	✔			✔		✔
Pre-certified analyzer	✔								
Bulb/Lamp Replacement	✔								
PC Board Replacement	✔								
Analog Output Trim	✔								
Optics Cleaning/Replacement	✔								
Optical Bench Alignment	✔								
Electro-optic Heater Replacement	✔								
Detector Repair/Replacement	✔								
Chopper Motor Replacement	✔								
Chopper Bandpass Filter(s) Replacement	✔								
O_2 Analyzer:									
Analyzer replacement	✔		✔				✔	✔(8)	✔
Pre-certified analyzer	✔								
Linearizer circuit replacement	✔		✔						
ZrO_2 cell replacement	✔								
PC board replacement/adjustment	✔								
Source lamp replacement	✔								
Photocell replacement	✔								
Detector replacement	✔								
Oven temp. adj. or replacement	✔								

(1)Satisfactory completion of the indicated quality assessment activity will be sufficient demonstration of the CEMS ability to generate valid data. A change of any component listed on the original CEMS application by specific model and/or serial number of for which specific details such as materials of construction or design are included requires formal notification to the District and will result in a response from the District.
(2) CEMS Calibration: A calibration performed in normal operating mode to confirm proper operation and establish new calibration correction factors or valid data generation.
(3) Linearity test consists of conducting a cylinder gas audit (CGA) as described in 40 CFR 60, Appendix F, 40 CFR 75, or as defined in an SCAQMD approved QAP for the facility.
(4) Applicable to systems where ammonia is present.
(5) Can use any NIST traceable gas
(6) May not be applicable to dilution probe systems; consult SCAQMD
(7) As defined in 40 CFR 60, Appendix F
(8) If analyzer is used for EPA 'F'-factor calculation of stack flow rate (as described in EPA Method 19)
(9) Refer to applicable sections of facility approved QAP or consult SCAQMD for additional specific guidance

Matrix 2: UnLike Replacements Only

All replacements are of different manufacturer, model or specification

RECLAIM CONTINUOUS EMISSION MONITORING SYSTEM
QUALITY ASSESSMENT TESTS FOLLOWING QUALITY CONTROL ACTIVITIES[1]

Quality Assessment ⇒ / Quality Control ⇓	CEMS Calibration[2]	Manual Transmitter Calibration	Linearity Test[3]	Interference (as applicable)[4]	NO_2 Converter Efficiency[5]	Sample System Bias[6]	Analytical RATA[7]	Stack Flow Rate RATA[7]	Response Time
Sample System Component:									
Probe Relocation	✓					✓	✓[8]		✓
Probe replacement	✓					✓			✓
Probe filter replacement	✓					✓			✓
Heated sample line replacement	✓					✓			✓
Condenser replacement	✓					✓			✓
Sample pump replacement	✓					✓			✓
Sample filter replacement	✓					✓			✓
Hardware/Software Components:									
CEM controller components replacement	✓								
DAHS hardware replacement	✓								
DAHS software change	✓								
Fuel Flow Metering System:									
Flow Computer								✓	
Primary Element Replacement								✓	
Transmitter replacement		✓							
In-Stack Flow Monitor:									
Sensor Replacement		✓						✓	
Transmitter Replacement		✓							
NO_x Analyzer:									
NO_2 Converter replacement	✓			✓	✓				
Photomultiplier tube replacement	✓		✓						
Analyzer replacement	✓		✓	✓	✓	✓	✓		✓
Analyzer vacuum pump repair/replacement	✓								
Analyzer filter replacement	✓								
Ozone generator replacement	✓								
Critical Orifice / Capillary replacement	✓								
PC Board Replacement	✓								
Thermo-electric temp cont. board	✓								
Optics replacement	✓			✓					
Chopper belt/motor replacement	✓								

Matrix 2: UnLike Replacements Only

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RECLAIM CONTINUOUS EMISSION MONITORING SYSTEM
QUALITY ASSESSMENT TESTS FOLLOWING QUALITY CONTROL ACTIVITIES[1]

Quality Assessment ⇒ / Quality Control ⇓	CEMS Calibration[2]	Manual Transmitter Calibration	Linearity Test[3]	Interference (as applicable)[4]	NO_2 Converter Efficiency[5]	Sample System Bias[6]	Analytical RATA[7]	Stack Flow Rate RATA[7]	Response Time
SO_2 Analyzer:									
Analyzer Replacement	✔		✔				✔		✔
Bulb/Lamp Replacement	✔								
PC Board Replacement	✔								
Analog Output Trim Replacement	✔		✔						
Replace Optical Bench	✔		✔				✔		
Optics Replacement	✔		✔						
Electro-optic Heater Replacement	✔								
Detector Replacement	✔		✔						
Chopper Motor Replacement	✔								
Chopper Bandpass Filter(s) Replacement	✔								
O_2 Analyzer:									
Analyzer replacement	✔		✔				✔	✔[9]	✔
Replace Linearizer Circuit	✔		✔						
Cell replacement	✔		✔						
PC board replacement	✔								
Source lamp replacement	✔								
Photocell replacement	✔								
Detector replacement	✔								
Oven temp. replacement	✔								

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(2) CEMS Calibration: A calibration performed in normal operating mode to confirm proper operation and establish new calibration correction factors or valid data generation.
(3) Linearity test consists of conducting a cylinder gas audit (CGA) as described in 40 CFR 60, Appendix F, 40 CFR 75, or as defined in an SCAQMD approved QAP for the facility.
(4) Applicable to systems where ammonia is present.
(5) Can use any NIST traceable gas
(6) May not be applicable to dilution probe systems; consult SCAQMD
(7) As defined in 40 CFR 60, Appendix F
(8) Stratification test must be done
(9) If analyzer is used for EPA 'F'-factor calculation of stack flow rate (as described in EPA Method 19)